

## CLAIMS

1. A light emitting element comprising:

a first electrode;

a second electrode; and

5 a plurality of layers located between the first electrode and the second electrode,

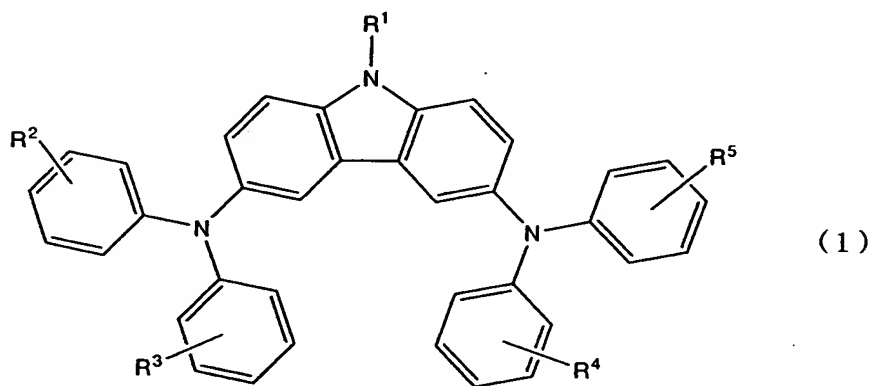
wherein the plurality of layers comprises a layer comprising a light emitting substance,

wherein at least one of the plurality of layers comprises:

10 a carbazole derivative represented by General Formula (1); and

a metal oxide, and

[Chemical Formula 1]



wherein in the formula, R¹ refers to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and R² to R⁵ is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon

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number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

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2. A light emitting element comprising:

a first electrode;

a second electrode; and

a plurality of layers located between the first electrode and the second

10 electrode,

wherein the plurality of layers comprises:

a first layer comprising a light emitting substance; and

a second layer for generating a hole,

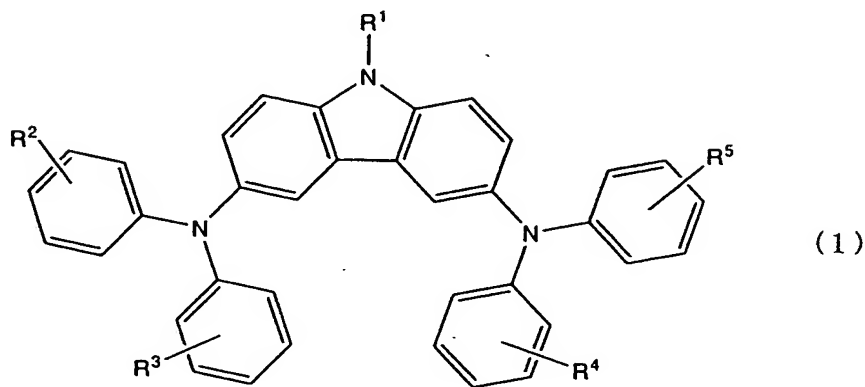
wherein the second layer comprises:

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a carbazole derivative represented by General Formula (1); and

a metal oxide, and

[Chemical Formula 1]



wherein in the formula, R¹ refers to hydrogen, halogen, a cyano group, an alkyl

group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and  $R^2$  to  $R^5$  is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

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3. A light emitting element comprising:

a first electrode;

a second electrode; and

a plurality of layers located between the first electrode and the second

15 electrode,

wherein the plurality of layers comprises:

a first layer comprising a light emitting substance; and

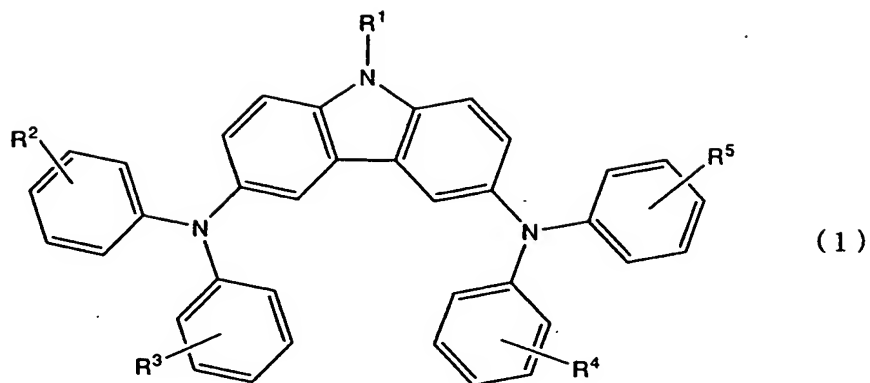
a second layer for transporting a hole,

wherein the second layer comprises:

20 a carbazole derivative represented by General Formula (1); and

a metal oxide, and

[Chemical Formula 1]



wherein in the formula,  $R^1$  refers to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and  $R^2$  to  $R^5$  is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

4. A light emitting element comprising:

a first electrode;

15 a second electrode; and

a plurality of layers located between the first electrode and the second electrode,

wherein light emission is performed when a potential of the first electrode is higher than that of the second electrode,

wherein the plurality of layers comprises:

a first layer comprising a light emitting substance; and

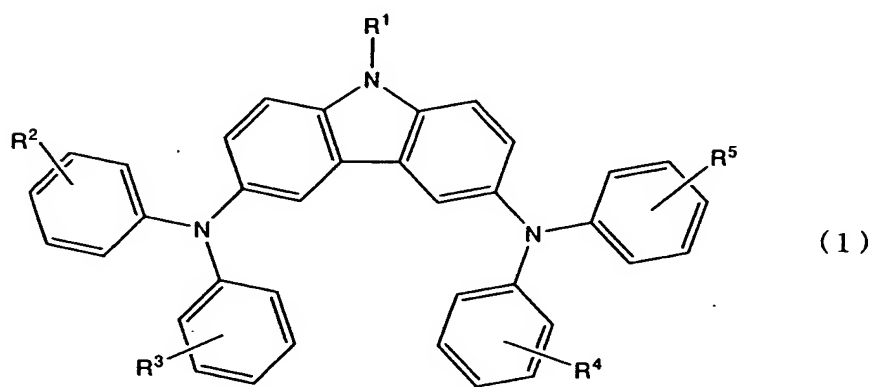
a second layer located between the first electrode and the first layer,

wherein the second layer comprises:

5 a carbazole derivative represented by General Formula (1); and

a metal oxide, and

[Chemical Formula 1]



wherein in the formula, R<sup>1</sup> refers to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxy group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and R<sup>2</sup> to R<sup>5</sup> is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxy group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

5. A light emitting element comprising:

a first electrode;

a second electrode; and

a plurality of layers located between the first electrode and the second electrode,

wherein light emission is performed when a potential of the first electrode is higher than that of the second electrode,

wherein the plurality of layers comprises:

a first layer comprising a light emitting substance; and

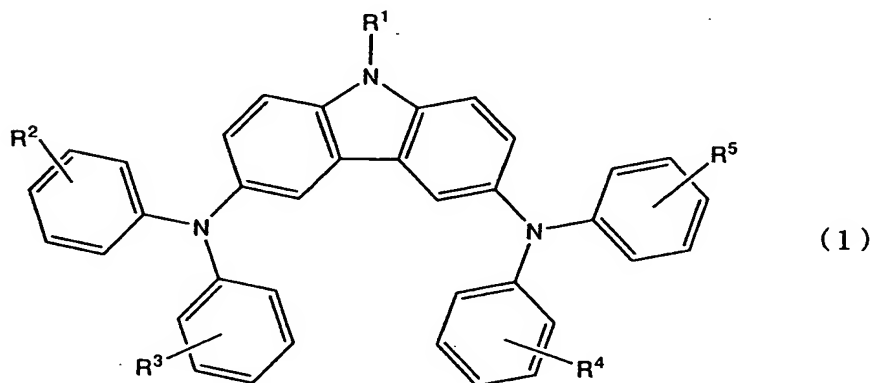
a second layer located between the second electrode and the first layer,

wherein the second layer comprises:

a carbazole derivative represented by General Formula (1); and

a metal oxide, and

[Chemical Formula 1]



wherein in the formula, R¹ refers to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxy group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and R² to

R<sup>5</sup> is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

6. A light emitting element comprising:

a first electrode;

10 a second electrode; and

a plurality of layers located between the first electrode and the second electrode,

wherein light emission is performed when a potential of the first electrode is higher than that of the second electrode,

15 wherein the plurality of layers comprises:

a first layer comprising a light emitting substance;

a second layer located between the first electrode and the first layer, and

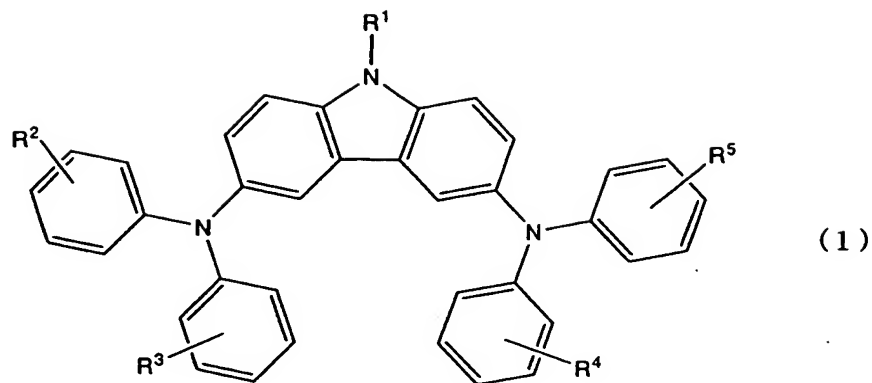
a third layer located between the second electrode and the first layer,

wherein both of the second layer and the third layer comprise:

20 a carbazole derivative represented by General Formula (1); and

a metal oxide, and

[Chemical Formula 1]



wherein in the formula, R<sup>1</sup> refers to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and R<sup>2</sup> to R<sup>5</sup> is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

7. A light emitting element comprising:

a first electrode;

15 a second electrode; and

a plurality of layers located between the first electrode and the second electrode,

wherein the plurality of layers comprises a layer comprising a light emitting substance,

a substance for accepting an electron from the carbazole derivative, and

(1)

The chemical structure (1) is a fluorene derivative. It consists of a central fluorene core, which is a tricyclic system with two benzene rings fused to a central five-membered ring containing a nitrogen atom (N). The nitrogen atom is substituted with a group R<sup>1</sup>. The fluorene core is further substituted with five phenyl groups, each labeled with a substituent R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, or R<sup>5</sup>. Specifically, the fluorene core has two phenyl groups attached to the 9-position (R<sup>2</sup> and R<sup>3</sup>) and two phenyl groups attached to the 10-position (R<sup>4</sup> and R<sup>5</sup>). The fifth phenyl group is attached to the nitrogen atom (R<sup>1</sup>).

wherein in the formula,  $R^1$  refers to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxy group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and  $R^2$  to  $R^5$  is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxy group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

a second electrode; and

a plurality of layers located between the first electrode and the second electrode,

wherein the plurality of layers comprises:

a first layer comprising a light emitting substance; and

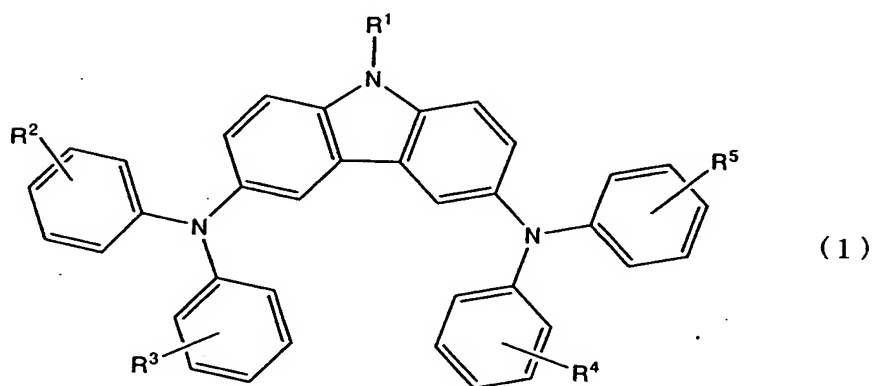
5 a second layer for generating a hole,

wherein the second layer comprises:

a carbazole derivative represented by General Formula (1); and

a substance for accepting an electron from the carbazole derivative, and

[Chemical Formula 1]



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wherein in the formula, R<sup>1</sup> refers to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxy group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and R<sup>2</sup> to R<sup>5</sup> is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxy group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or

15

unsubstituted heterocycle residue, or a carbazolyl group.

9. A light emitting element comprising:

a first electrode;

5 a second electrode; and

a plurality of layers located between the first electrode and the second electrode,

wherein the plurality of layers comprises:

a first layer comprising a light emitting substance; and

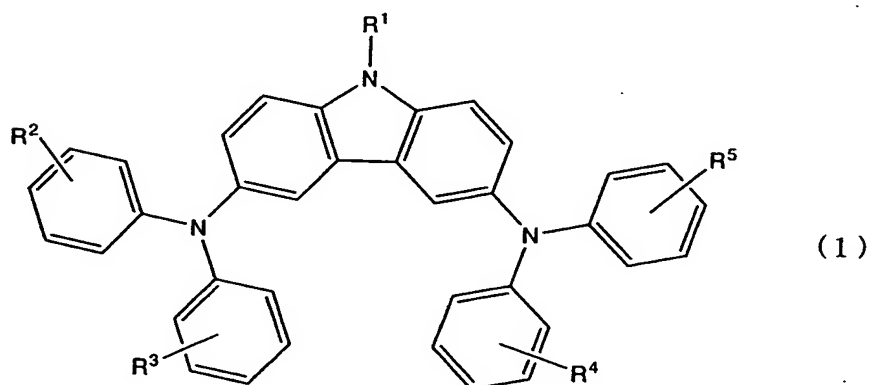
10 a second layer for transporting a hole,

wherein the second layer comprises:

a carbazole derivative represented by General Formula (1); and

a substance for accepting an electron from the carbazole derivative, and

[Chemical Formula 1]



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wherein in the formula, R<sup>1</sup> refers to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxy group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and R<sup>2</sup> to

R<sup>5</sup> is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

10. A light emitting element comprising:

a first electrode;

10 a second electrode; and

a plurality of layers located between the first electrode and the second electrode,

wherein light emission is performed when a potential of the first electrode is higher than that of the second electrode,

15 wherein the plurality of layers comprises:

a first layer comprising a light emitting substance; and

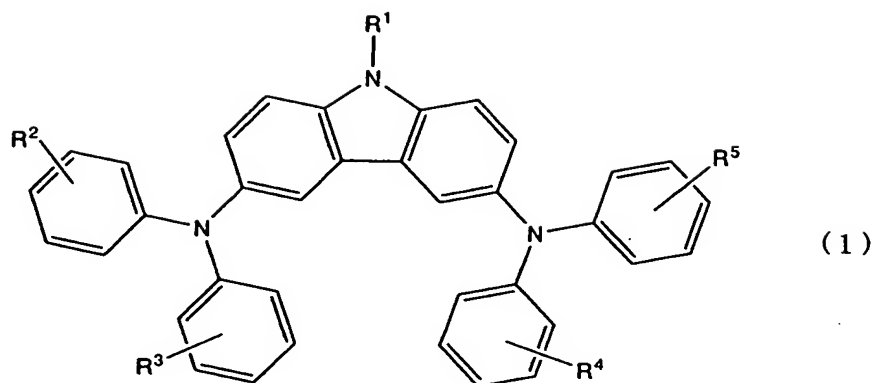
a second layer located between the first electrode and the first layer,

wherein the second layer comprises:

a carbazole derivative represented by General Formula (1); and

20 a substance for accepting an electron from the carbazole derivative, and

[Chemical Formula 1]



wherein in the formula,  $R^1$  refers to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, a substituted or unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and  $R^2$  to  $R^5$  is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

11. A light emitting element comprising:

a first electrode;

15 a second electrode; and

a plurality of layers located between the first electrode and the second electrode,

wherein light emission is performed when a potential of the first electrode is higher than that of the second electrode,

wherein the plurality of layers comprises:

a first layer comprising a light emitting substance; and

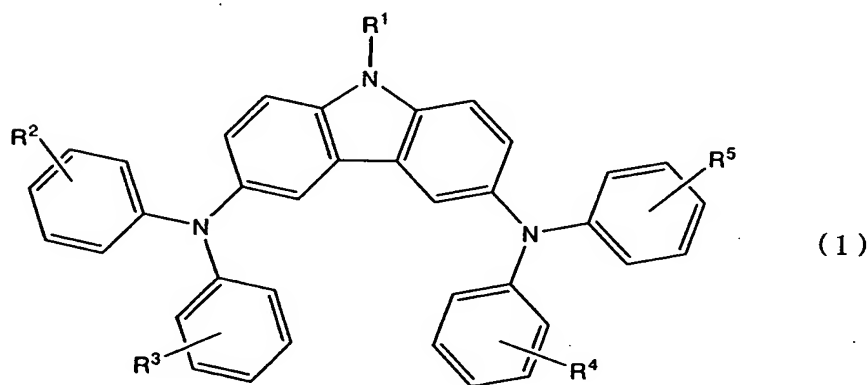
a second layer located between the second electrode and the first layer,

wherein the second layer comprises:

5 a carbazole derivative represented by General Formula (1); and

a substance for accepting an electron from the carbazole derivative, and

[Chemical Formula 1]



wherein in the formula, R<sup>1</sup> refers to hydrogen, halogen, a cyano group, an alkyl  
 10 group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of  
 1 to 20, an alkoxy group having a carbon number of 1 to 20, a substituted or  
 unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and R<sup>2</sup> to  
 R<sup>5</sup> is the same or different material and refer to hydrogen, halogen, a cyano group, an  
 alkyl group having a carbon number of 1 to 20, an alkoxy group having a carbon  
 15 number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group  
 having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1  
 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or  
 unsubstituted heterocycle residue, or a carbazolyl group.

12. A light emitting element comprising:

a first electrode;

a second electrode; and

a plurality of layers located between the first electrode and the second  
5 electrode,

wherein light emission is performed when a potential of the first electrode is  
higher than that of the second electrode,

wherein the plurality of layers comprises:

a first layer comprising a light emitting substance;

10 a second layer located between the first electrode and the first layer, and

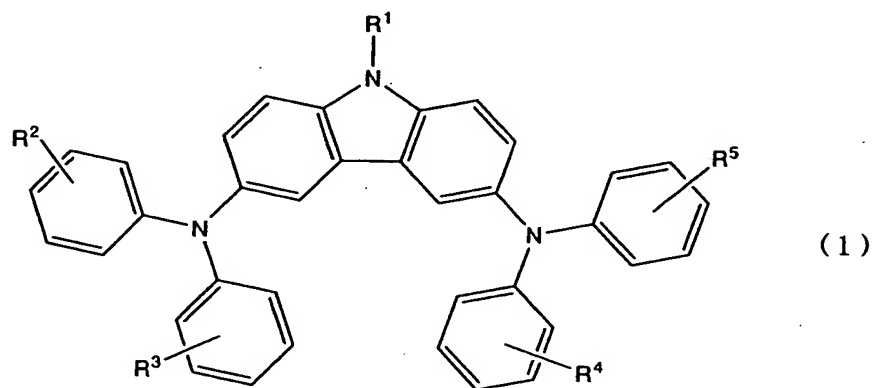
a third layer located between the second electrode and the first layer,

wherein both of the second layer and the third layer comprise:

a carbazole derivative represented by General Formula (1); and

a substance for accepting an electron from the carbazole derivative, and

15 [Chemical Formula 1]



wherein in the formula, R¹ refers to hydrogen, halogen, a cyano group, an alkyl  
group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of  
1 to 20, an alkoxy group having a carbon number of 1 to 20, a substituted or

unsubstituted aryl group, or a substituted or unsubstituted heterocycle residue, and  $R^2$  to  $R^5$  is the same or different material and refer to hydrogen, halogen, a cyano group, an alkyl group having a carbon number of 1 to 20, an alkoxyl group having a carbon number of 1 to 20, an acyl group having a carbon number of 1 to 20, a haloalkyl group having a carbon number of 1 to 20, a dialkylamino group having a carbon number of 1 to 20, a diarylamino group having a carbon number of 1 to 20, a substituted or unsubstituted heterocycle residue, or a carbazolyl group.

13. The light emitting element according to any one of Claims 1 to 6, wherein the metal oxide is one or a plurality of oxides of any transition metal of Group 4 to Group 12 in the periodic table.

14. The light emitting element according to any one of Claims 1 to 6, wherein the metal oxide is one or a plurality of oxides of any transition metal of Group 4 to Group 8 in the periodic table.

15. The light emitting element according to any one of Claims 1 to 6, wherein the metal oxide is one or a plurality of oxides selected from the group consisting of molybdenum oxide ( $\text{MoO}_x$ ), vanadium oxide ( $\text{VO}_x$ ), ruthenium oxide ( $\text{RuO}_x$ ), tungsten oxide ( $\text{WO}_x$ ), rhenium oxide ( $\text{ReO}_x$ ), titanium oxide ( $\text{TiO}_x$ ), chromium oxide ( $\text{CrO}_x$ ), zirconium oxide ( $\text{ZrO}_x$ ), hafnium oxide ( $\text{HfO}_x$ ), and tantalum oxide ( $\text{TaO}_x$ ).

16. A light emitting device, comprising the light emitting element

according to any one of Claims 1 to 15 as a pixel or a light source.

17. An electronic device, comprising the light emitting device according to Claim 16.